## REMARKS

**Status of this application**

Claims 1-17 were examined, claims 8 and 9 have been canceled by this response, claims 1, 4, 5, 10, 13 and 17 have been amended, and reconsideration of the remaining pending claims 1-7 and 10-17 as now presented is requested.

Claims 8 and 9 were objected to in the outstanding Office Action under 37 CFR §1.75 as being a substantial duplicate of claims 2 and 3. This response cancels the duplicate claims 8 and 9.

Claims 3 and 9 were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 4 of U.S. Patent No. 7,181,363. Claim 4 was rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 6 of U.S. Patent No. 7,181,363. Claims 14 and 16 were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 7,181,363. Claim 7 was rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 24 of U.S.. Patent No. 7,181,362. This response requests reconsideration of these double patenting rejections.

Claims 1 and 13 were rejected under 35 U.S.C. §102(b) as being anticipated by Inami et al. U.S. Patent No. 6,341,869, hereinafter referred to as "Inami."

Claims 4-7 were rejected under 35 U.S.C. §103(a) as being unpatentable over Inami in view of Pryor U.S. Patent No. 5,982,352, hereinafter referred to as "Pryor." Note: the Action cites "Patent 5,892,352" which is actually a patent issued to Kolar et al. (as listed on the Notice of References Cited attached to the Action). From the context, however, it appears that the Examiner intended to cite Prior Patent 5,982,352, and that reference is discussed below in Remarks.

Claims 1-4 and 8-17 were rejected under 35 U.S.C. §103(a) as being unpatentable over Anderson et al. U.S. Patent No. 6,259,815, hereinafter referred to as "Anderson" in view of Machtig U.S. Patent No. 5,221,937, hereinafter referred to as "Machtig".

Reconsideration of the rejections advanced in the outstanding action is requested in view of the foregoing amendments and the remarks below.

**The double patenting rejections**

Reconsideration of the obviousness-type double patenting rejections is requested since the subject claimed in this application is significantly different from, and would not have been obvious in view of, the subject matter claimed in Patent No. 7,181,363 (hereinafter the "'363 Patent").

**Claim 3** was rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 4 of the '363 Patent. Reconsideration is requested. Claim 3 of the present application requires several elements which are not specified by claim 4 of the '763 patent and would not be obvious in view of that claimed subject matter. Claim 3 is dependent upon claim 1 as amended which describes a method for evaluating a three dimensional set of point values which are stored in a digital memory device and includes a processor coupled to the digital memory and to real-time position and geometry sensors that compares the stored set of point values to surface geometry data produced by the sensors to identify a subset of the point values that are congruent with corresponding locations in said three dimensional surface currently specified by said surface geometry data, projecting an image representative of said subset of point values onto said three dimensional surface of said physical object. Claim 4 of Patent 7,181,363 describes nothing like that. There is no basis whatsoever for concluding that the subject matter set forth in claim 3 of this application would be obvious in view of the subject matter set forth in claim 4 of the '363 patent and the double patenting rejection of claim 3 should accordingly be withdrawn.

Similarly, **claim 4** was rejected on the ground of nonstatutory obviousness-type double patenting, as being unpatentable over claim 6 of the '363 Patent. Claim 4, like claim 3 discussed above, incorporates the limitations of claim 1 which describe subject matter nowhere described or suggested in claim 6 of the '363 patent. The double patenting rejection of claim 4 should accordingly be withdrawn for the same reasons given above with respect to claim 3.

**Claims 14 and 16** were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 7,181,363. In the same way that claims 3 and 4 requires the presence of subject matter that is not set forth in claim 1 of the '363 Patent and would not be obvious in view the subject matter that is recited in that patent claim,

there is no basis for the asserted double patenting rejection of claims 14 and 16. Both of these claims are dependent on claim 13 which requires the presence of a memory device for storing a three dimensional array of data values and a processor for comparing this stored three dimensional array of data values with surface position data from a position sensor to identify selected ones of array of data values which have positions in the array that correspond to the current geometry of the surface specified by the position sensor data. Nothing like that is describes by or would have been obvious in view of the subject matter set forth in claim 1 of the '363 patent.

Reconsideration and withdrawal of the double patenting rejections of claims 3, 4, 14 and 16 is respectfully requested.

**The rejection of claims 1 and 13 as anticipated by Inami**

Claims 1 and 13 were rejected under 35 U.S.C. §102(b) as being anticipated by Inami.

Regarding claims 1 and 13, the Examiner suggests that Inami teaches "a method and apparatus for evaluating a three dimensional array of data values." It does not.

As the Examiner correctly observes, Inami discloses a manually manipulable physical object which defines a surface whose shape or position may be altered (Fig. 2 element 11A, col. 6 lines 39-50 and col. 7 lines 18-26), teaches that, as the screen element 11A is moved, a new image is projected onto it, and further discloses a position sensor for generating position data specifying the at least the position of the screen surface (Fig. 2 elements SE1 and SE2, col. 8 lines 17-19).

But Inami does not disclose "a processor for comparing said three dimensional array of data values with said position data to identify selected ones of said data values which have positions in said array that correspond to the geometry of said surface" as suggested by the Examiner. Inami nowhere discloses any mechanism or method for evaluating a three dimensional set of point values , and does not disclose doing that by comparing such a data set with sensor-produced data specifying the position and geometry of a physical object. The Examiner cites the processor shown in Fig. 2 as element 13A and described at col. 8 lines 19-23 and col. 7, lines 15-18, which describe how the processor 13A produces an image that is projected on movable screen 11A that is changed to reflect the viewpoint of the observer. There is no suggestion that the image projected onto the screen 11A is representative of a subset of

point values in the data set that are identified as being congruent with corresponding locations on the physical surface.

Claims 1 and 13 have been amended to affirmatively state that the three dimensional array of data values is stored in a memory device, that the sensors produce data value indicating the position of the movable physical surface, and that the processor compares the sensor data with the stored data set in the memory device to identify a subset of the stored data set values that are represented by the image projected onto the physical object.

It is accordingly requested that the rejection of claims 1 and 13 as being anticipated by Inami be withdrawn.

Regarding dependent claims 2, 3, 8, 9, 14, 15 and 16, the Examiner suggested that Inami teaches that the physical object is constructed of a material which forms a surface whose geometry varies when said object is manually manipulated (and retains its shape after being deformed) and upon which an image may be projected and viewed by a user, citing Fig. 2 element 11A. (Note, the citation of "col. 51-53" is not understood since Inami has only 14 columns.) While Inami's screen 11A is movable as noted by the Examiner, but it is not constructed of "a deformable material that may be shaped" as required by claims 2-3 (and canceled claims 8-9), and claims 14-16. These dependent claims accordingly further distinguish applicants' invention from the arrangement taught by Inami for this additional reason.

**The rejection of claims 4-7 as obvious over Inami in view of Pryor**

Claims 4-7, which were rejected under 35 U.S.C. §103(a) as being unpatentable over Inami in view of Pryor, are dependent on claim 1 whose limitations distinguish over Inami for the reasons presented above.

The Examiner acknowledges that Inami fails to teach that the position sensor is a laser scanner as set forth in **claim 4,** but suggests that it would have been obvious to replace Inami's mechanical joint position sensor with a laser scanner. Applicants' concede the laser scanners are well known, Applicants' preferred embodiment uses a commercially available laser scanner [0018] to determine the geometric position of the modeling surface. For the purposes of this response, applicants rely on the limitations in parent claim 1 for the allowability of dependent claim 4

Regarding **claims 5-7,** the Examiner acknowledged that Inami fails to teach that the position sensor measures the position of said surface by measuring the extent to which light is attenuated when passing through a translucent material to reach said surface. The Examiner suggested, however, that Pryor teaches a user-interactive screen in which the position of the screen deformation triggered by user-force is monitored by projecting light across the screen's thickness and using a camera system to locate the change from light to dark (or vice-versa) caused by variation in thickness of the screen (citing Pryor col. 32, lines 41-50). It is submitted however that the cited passage in Pryor does not describe position and geometry sensors that measure the position of said surface by measuring the extent to which light is attenuated when passing through said translucent material to reach said surface as required by claims 5-7. In Pryor, the screen is consists of two members 1530 and 1531 (Fig. 15, bottom) which, when pressed together, cause a bright or dark spot to appear on the screen. The position of this spot is then determined by the stereo cameras 1510 and 1511 and the image processor 1514 by "stereo triangulation techniques" as noted at col. 32, lines 30-31. The position of the spot is not determined by measuring the extent to which light is attenuated when passing through said translucent material to reach said surface as required by claims 5-7. Claims 5-7, which are dependent on claim 1 and hence allowable for the reasons presented with respect to claim 1, are allowable for the additional reason that Pryor does not disclose a mechanism for measuring the position of the surface of a translucent object by measuring the extent to which light is attenuated when it passes through the translucent object.

**Claims 6 and 7**, which are dependent on claim 5, further state that the physical object comprises an aggregation of translucent objects (claim 6) or is formed from translucent beads (claim 7). Neither Inami nor Pryor disclose translucent objects or beads, and claims 6-7 are accordingly allowable for this additional reason.

Reconsideration of the rejection of claims 4-7 as being obvious in view of the combination of Inami and Pryor is requested.

**The rejection of claims 1-4 and 10-17 as obvious in view of Anderson and Machtig**

Claims 1-4 and 8-17 were rejected under 35 U.S.C. 103(a) as being unpatentable over

Anderson in view of Machtig. As noted earlier, claims 8 and 9 have been canceled as duplicative.

With respect to independent **claims 1 and 13**, The Examiner noted that "Anderson teaches . . . a manually manipulable physical object which defines a surface whose shape or position may be altered" but "fails to teach a projector for illuminating said surface of said physical object with an image representative of said selected ones of said data values." The Examiner suggested, however, that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Machtig's system for creating mannequins in which the image of a model/actor is projected onto a quantity of clay to aid a user of any skill in sculpting the clay face, citing Machtig col. 9 lines 1-26 and lines 48-51.

Reconsideration is requested. Anderson's system is used to recognize and identify objects. Anderson compares the sensor data defining the surface of a physical object with a plurality of stored data sets representing three dimensional shapes ("templates" ) to find the closest match, and thereby classifies the physical object. Anderson identifies the particular 3-dimensional template shape that best matches, and hence identifies, the physical shape being evaluated. Anderson would have no reason to convert the matched template into a visual image that is projected onto the physical object and one skilled in the art would not be motivated to use the image projection method used by Machtig in Anderson's object identification system.

The Examiner suggests that *"Anderson further teaches that said physical object is constructed of a material which forms a surface whose geometry varies when said object is manually manipulated (and retains its shape after being deformed) and upon which an image may be projected and viewed by a user, "* citing Anderson, col. 2 lines 32-35. However, the cited passage merely states that the physical object may be made of clay to model a variety of common objects, and makes no suggestion that an image could or should be projected onto that surface and viewed by the user.

Machtig describes an arrangement including a sculpting table surface 18 which supports a quantity of clay that an operator shapes into the likeness of an actor whose face image is projected onto the clay (Fig. 2A, col. 9, lines 21-26). The disclosed arrangement permits the operator to mold the clay in accordance with the visual projection of the actor's face onto the clay.

The Examiner suggests that Anderson's object identification system could be modified by adding Machtig's projector "*such that once the rough 3D object was matched with a template in Anderson's database, the template would be projected onto the clay object to assist the user in improving, refining or even painting it.*"

It is noted that the goal of Anderson's system is to identify the physical object, not to "improve, refine or paint it." If Anderson wanted to create a physical object matching a known template, Anderson could simply project the known template onto the clay as Machtig does, without any need to scan the clay object or compare the scanned data with the template data.

Note also that Anderson does not contemplate or teach reshaping the physical object while it is being scanned or after it is scanned. It is scanned "as is" and its sensed shape is compared with a database of shapes to find the closest match. One of ordinary skill would have no reason to modify Anderson's object identification system to incorporate the projection assisted sculpturing system taught by Machtig.

Moreover, even if the proposed modification were made, it would not yield the method or apparatus for evaluating a three dimensional array of data values claimed by applicants. All of the claims require the use of a processor for comparing a stored set of point values to the sensed surface geometry data to identify a subset of those point values that are congruent with corresponding locations in the three dimensional surface, and then projecting an image representative of the identified subset of point values identified by the processor onto the three dimensional surface of said physical object. Anderson does not identify a subset of point values in an array of point values as claimed, but instead identifies one of a variety of alternative sets of values (templates) which best match the shape of the physical object in order to classify it.

Moreover, Anderson as modified by Machtig would not provide the claimed system for evaluating a three dimensional array of values in which a physical object is manually manipulated to reposition its three dimensional surface to cause a new image representative of a different subset of point values to be projected onto that surface as required by claim 1 and by claim 13 as amended. In Anderson, no image is projected at all and, in Machtig, the image projected onto the clay is not changed as the face is sculpted.

The rejection of claims 1-4 and 10-17 as obvious in view of Anderson and Machtig should be reconsidered and withdrawn for the reasons given above.

Regarding claims 10 and 17, the Examiner suggests that Anderson further teaches that the physical object comprises an aggregation of smaller movable objects which may be individually moved to alter the shape or position of said surface, citing Anderson, col. 2 lines 35-38, and noting that in Fig. lb, some of the clay models have "extremities" that can be easily manipulated to change the shape. Anderson uses moldable clay to form models whose shape is then evaluated by comparing it to stored shape templates. The shape of the clay models is not changed during the evaluation whereas, in applicants' invention, the shape of the scanned surface is changed to vary scanned position data being compared to a single three dimensional array of data to vary the image projected on the moving surface. Claims 10 and 17 has been amended to clarify this distinction. Dependent claims 10 and 17 as amended, which are allowable for the reasons presented above with respect to their parent claims, are believed to be patentable for this additional reason.

Regarding claim 11, the Examiner suggested that Anderson further teaches that the smaller objects comprise rectilinear blocks of material, citing the 3rd model from the left on the top row of Fig. 1B. Regarding claim 12, the Examiner noted that Anderson further teaches that the smaller objects comprise substantially spherical beads as shown by the 1st model from the left on the bottom row of Fig. 1B. However, as noted by Anderson at col. 2, line 43 and again at line 62, the clay model is first formed by the user and then placed on the scanning table. It's shape is not altered during the scanning and evaluation process as claimed by applicants. Claims 11 and 12 are accordingly believed to be allowable for this additional reason.

**Conclusion**

Reconsideration and allowance of claims 1-7 and 10-17 as now presented is requested. This application is believed to be in condition for allowance.

Respectfully submitted,

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